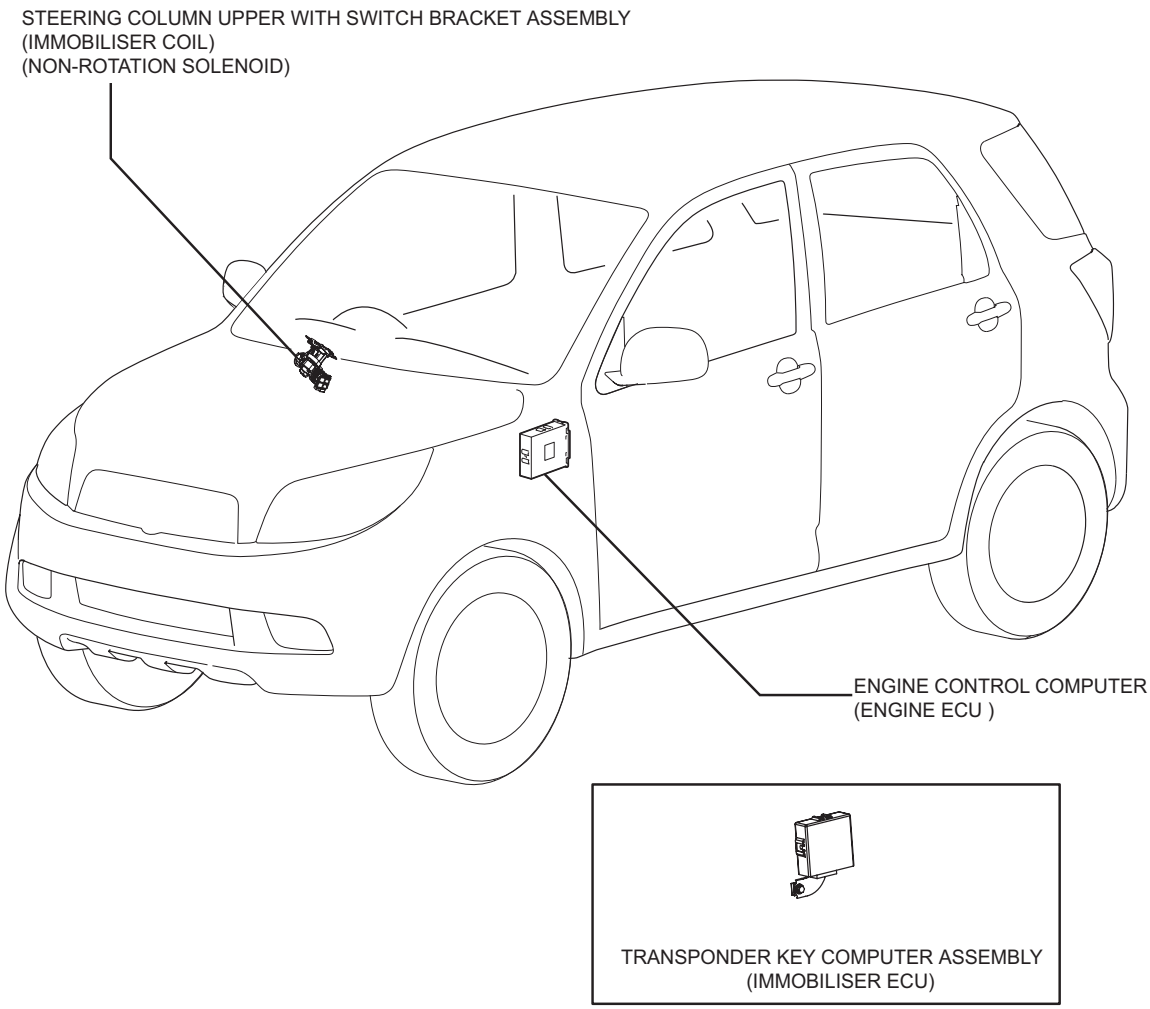
ENGINE IMMOBILISER SYSTEM

LOCATION



DIAGNOSTIC TROUBLE CODE CHART

DTC No.	Diagnostic Item	Code Memory	See Page
B2780/15	Open in the PUSH or KEY SW circuit	○	EI-10
B2788/41	Communication Error (code does not match)	○	EI-13
B2789/42	Communication Error (no response)	○	EI-13

DTC No.	Diagnostic Item	Code Memory	See Page
B2793/23	Immobiliser: Communication Malfunction 1	○	EI-15
B2794/22	Immobiliser: Communication Malfunction 2	○	EI-16
B2795/21	Main Key ID Code Does Not Match	○	EI-17
B2796/12	Main Key Or Coil Malfunction	○	EI-18
B2797/24	Immobiliser: Communication Malfunction 4	○	EI-21
B2798/25	Immobiliser: Communication Malfunction 5	○	EI-21

PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See Page
Engine does not start	1. Transponder key	EI-15 EI-16 EI-18
	2. Engine control computer (engine ECU)	EI-13
	3. Transponder key computer assembly	EI-10 EI-13 EI-16 EI-18 EI-21
	4. Steering column upper with switch bracket assembly	EI-10 EI-16 EI-18 EI-21
	5. Wire harness	EI-10 EI-13 EI-18 EI-21
	6. Combination meter assembly	EI-10

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP

2	CONDUCT CUSTOMER PROBLEM ANALYSIS AND CHECK SYMPTOMS

HINT:
(See page EI-5)

3 **CHECK FOR DTCs OF EFI (engine control system)**

HINT:
(See page ES-8)

(a) Check for DTCs of the EFI system using the DS-II.

Result	Proceed to
DTC is not output	A
DTC is output	B

EI

B → **GO TO ENGINE CONTROL SYSTEM**

A

4 **CHECK FOR DTCs OF IMB (ENGINE IMMOBILISER SYSTEM)**

(a) Using the DS-II, check for DTCs (see page EI-1). Record any DTCs.
(b) Delete the DTCs.
(c) Reproduce the symptoms based on the recorded code, and check if the same DTC is output.

Result	Proceed to
DTC is not output	A
DTC is output	B

B → **GO TO TROUBLESHOOTING FOR EACH OUTPUT DTC**

A

5 **PROBLEM SYMPTOMS TABLE**

(a) Check if the symptom is listed in problem symptoms table (see page EI-2)

Result	Proceed to
Symptom is not listed in problem symptoms table	A
Symptom is listed in problem symptoms table	B

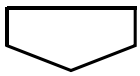
B → **GO TO INSPECTION PROCEDURE 9**

A

6 **PERFORM TROUBLESHOOTING BASED ON PROBLEM SYMPTOM**

(a) ECU DATA LIST / ACTIVE TEST (see page EI-9)
(b) ECU terminals (See page EI-7)

7	CHECK, REPAIR OR REPLACE



END

CUSTOMER PROBLEM ANALYSIS CHECK

EI

ENGINE IMMOBILISER SYSTEM Check Sheet

Date vehicle brought in
/ /

Customer's Name		License Plate No.		First registration year	20 __ / /
		Model		VIN	
Written by	Inspector's name	Engine Type		Odometer Reading	
Description of symptoms					

Date Problem First Occurred	/ / :Hour of the day ____AM/PM
Problem description	☐ Starting Trouble ☐ Security Indicator Illumination Malfunction ☐ Additional key registration not possible ☐ Others ( )
Frequency Problem Occurs	User (☐ Constant ☐ Frequent ☐ Occasional ☐ One time only) During dealer check (☐ Constant ☐ Frequent ☐ Occasional ☐ One time only ☐ No longer occurs)
Temperature and weather conditiions when problem occurred	1) Temperature : (Approx. ( )°C , 2) Weather : ☐ Clear ☐ Cloudy ☐ Rainy ☐ Snowy
Tendency to occur	☐ Morning driving ☐ Restarting the vehicle after driving approx. ( ) hours ☐ Others
Detailed check results when problem occurs	When having starting trouble did the vehicle start with another registered key? → ☐ YES ☐ NO When IG ON, does the security indicator turn off? → ☐ YES ☐ NO Does the engine crank normally? → ☐ YES ☐ NO Is another key attached to the key being used? → ☐ YES ☐ NO Immobiliser system DTC ( ) EFI system DTC ( ) Previous DTC ( )
History of changed problem parts	
Installed accessory parts	☐ Engine starter (genuine parts / others) ☐ Smart system ☐ Car navigation (genuine parts / others)
Other specified items	

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CHECK / CLEAR DTCs

1. PREPARE FOR INSPECTION

(a) Move the shift lever to the P position.

(b) Turn off the air conditioning.

2. CHECK DTCs (using DS-II)

(a) Connect the DS-II to the DLC.

(b) Following the prompts on the screen, select DIAGNOSIS / IMB / DIAGNOSTIC CODE to check DTCs.

HINT:

- If the check engine warning light remains on, wire harness may have a short (or pinched) or the engine control computer (engine ECU) may be malfunctioning.
- If the DS-II does not display DTCs or indicate the normal condition, and the indicator light does not flash, there may be an open in the TC circuit between the DLC connecter and each ECU or the engine control computer (engine ECU) may be malfunctioning.

3. CHECK DTCs (using the security indicator light)

NOTICE:

Turn the ignition switch to the ON position before reading the DTCs, and check that the security indicator light is flashing.

(a) Turn the ignition switch off.

(b) Using the diagnosis check wire, short terminals 13 (ECUT) and 4 (E) of the DLC.

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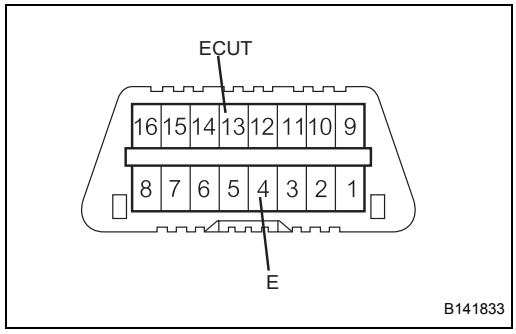
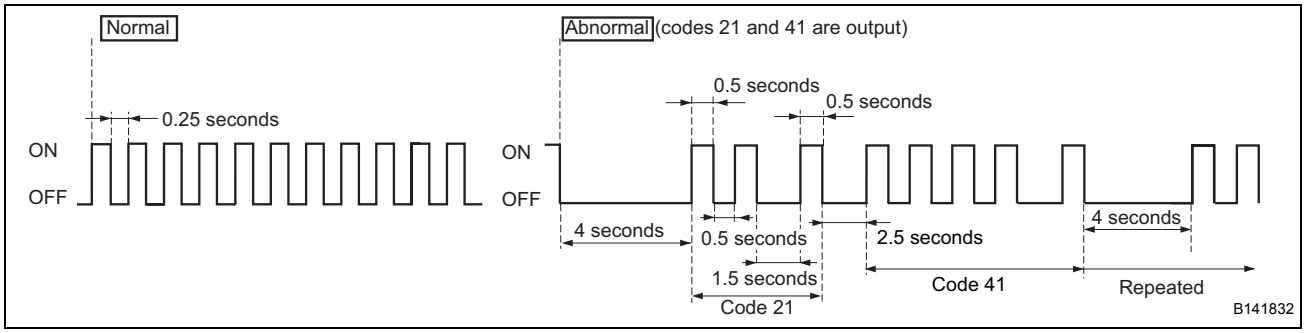
NOTICE:

- **Do not connect diagnosis check wire No. 2 to the wrong terminals. Doing so may cause malfunctions.**
- **Use only dedicated diagnosis check wire.**

(c) Turn the ignition switch to the ON position, and count the number of flashes of the security indicator light.





HINT:

- If the indicator light does not indicate a DTC (light does not come on), there may be an open in the TC terminal or the computer may be malfunctioning.
- If the security indicator light remains on, the wire harness may have a short circuit (pinched) or the computer may be malfunctioning.

- If an irrelevant DTC is output, the computer may be malfunctioning.

(d) Remove the diagnosis check wire.

4. CLEAR DTCs

(a) Using the DS-II, following the prompts on the screen, select CHECK DTC and CLEAR to clear the DTCs.

NOTICE:

- **If the DTCs cannot be cleared, turn the ignition switch off, then perform this procedure again.**
- **Selecting CLEAR on the ALL DTCs screen clear all system DTCs.**

ECU TERMINALS

1. TRANSPONDER KEY COMPUTER ASSEMBLY (IMMOBILISER ECU)

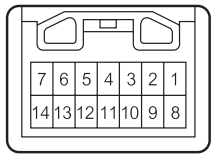
(a) Check immobiliser ECU.

(1) Disconnect the immobiliser ECU connector.

(2) Using the tester, measure the voltage and the continuity between the terminals of the connector on the vehicle side.

Standard:

Transponder Key Computer Assembly



B142045J01

Terminal No. (Terminal Symbols)	Item	Measurement Condition	Standard
7 (GND) ←→ Body ground	Continuity	Always	Continuity
1 (+B) ←→ 7 (GND)	Voltage	Always	10 to 14 V
2 (IG) ←→ 7 (GND)	Voltage	Ignition switch OFF → ON	1 V or less → 10 to 14 V

HINT:

If the result is not as specified, the wire harness on the vehicle side may be malfunctioning.

(3) Connect the connector.

(4) Measure the voltage between connecter terminals using the tester.

(5) Using an oscilloscope, check that a pulse is generated between terminals.

Standard:

Terminal No. (Terminal Symbols)	Measurement Condition	Standard
6(COL+) ←→ 13(COL-)	Key is not inserted in the ignition knob → Key is inserted	Pulse is generated
3 (KSW) ←→ 7 (GND)	Key is not inserted in the ignition knob → Key is inserted	1 V or less → 10 to 14 V
8 (SIO2) ←→ 7 (GND)	Ignition switch OFF → ON	Pulse is generated

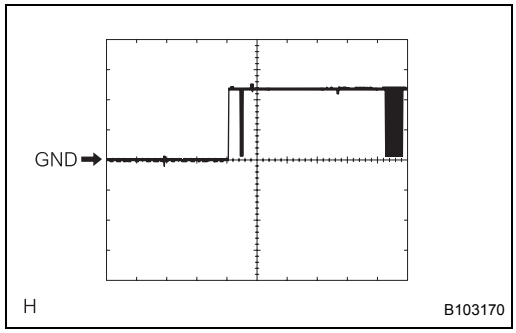
HINT:

If the result is not as specified, the transponder key computer assembly may be malfunctioning.

(b) Oscilloscope waveform

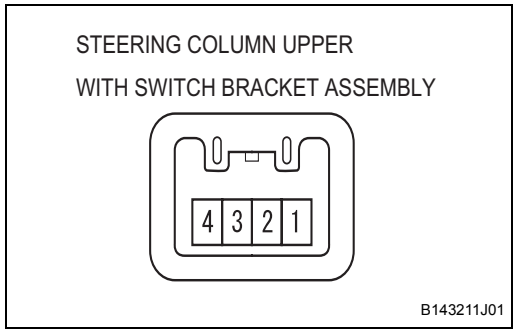
NOTICE:

The oscilloscope waveform as shown is an example and noise or chattering waveforms are not included.



(1) Waveform

Tester Connection	SIO2 ⟷ GND
Tool Setting	2 V/DIV, 20 msec/DIV
Measurement Condition	Ignition switch OFF → ON



2. STEERING COLUMN UPPER WITH SWITCH BRACKET ASSEMBLY

(a) Check the immobiliser system.

(1) Disconnect the steering column upper with switch bracket assembly connector.

(2) Measure the continuity between connecter terminals using a tester.

Standard:

Terminal No. (Terminal Symbols)	Measurement Condition	Standard
1(COL+) ⟷ 2(COL-)	Always	Continuity

HINT:

If the result is not as specified, the steering column upper with switch bracket assembly may be malfunctioning.

(3) Using the tester, measure the voltage between terminals of the connector on the vehicle side.

Standard:

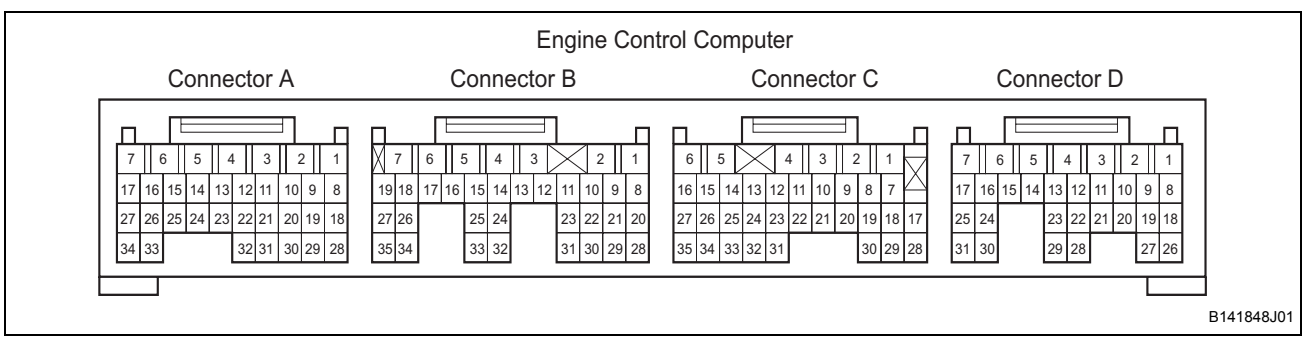
Terminal No. (Terminal Symbols)	Measurement Condition	Standard
4(+) ⟷ The body ground	Key is inserted in the ignition knob → Key is not inserted	10 to 14 V → 1 V or less

HINT:

If the result is not as specified, the wire harness on the vehicle side may be malfunctioning.

3. ENGINE CONTROL COMPUTER (ENGINE ECU)

(a) Check the immobiliser system.

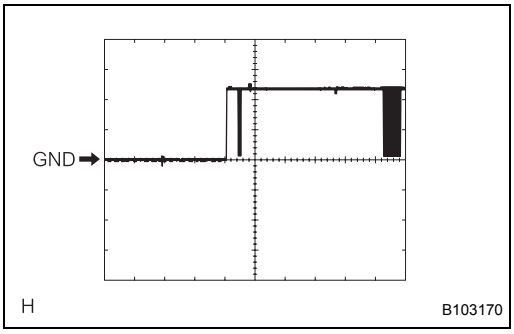


(1) Using an oscilloscope, check that a pulse is generated between terminals.
HINT:
See page ES-16 for the procedure for checking the power source voltage and the ground.
Standard:

Terminal No. (Terminal Symbols)	Measurement Condition	Standard
117 (SIO2) ←→ 125 (E1)	**Ignition switch OFF → ON**	**Pulse is generated**

(b) Oscilloscope waveform
NOTICE:
The oscilloscope waveform as shown is an example and noise or chattering waveforms are not included.

(1) Waveform



Tester Connection	SOL+ ←→ E1
Tool Setting	2 V/DIV, 20 msec/DIV
Measurement Condition	Ignition switch OFF → ON

ECU DATA LIST / ACTIVE TEST

1. ECU DATA LIST

(a) Determine if there are any malfunctions using the ECU data list function of DS-II.
Standard:

Transponder key computer assembly

Item (Symbols)	Inspection Condition	Reference value
TEST Terminal [T]	T terminal circuit: short / open	GND / OPEN
IG [IG]	IG ON	ON
KEY SW [KSW]	Key: inserted in the ignition knob / not inserted in the ignition knob	ON / OFF
REQ Permission Signal [REQ]	Request permission signal output in SIO2	Output / Stop
Transponder Communication [TP]	Main key: inserted in the ignition knob / not inserted in the ignition knob	Match / Does not match
Immobiliser Condition [IMO]	Main key: inserted in the ignition knob / not inserted in the ignition knob	UNSET/ SET
Key 4 [KKD4]	-	Registered/ Unregistered
Key 3 [KKD3]	-	Registered/ Unregistered
Key 2 [KKD2]	-	Registered/ Unregistered
Key 1 [KKD1]	-	Registered / Unregistered

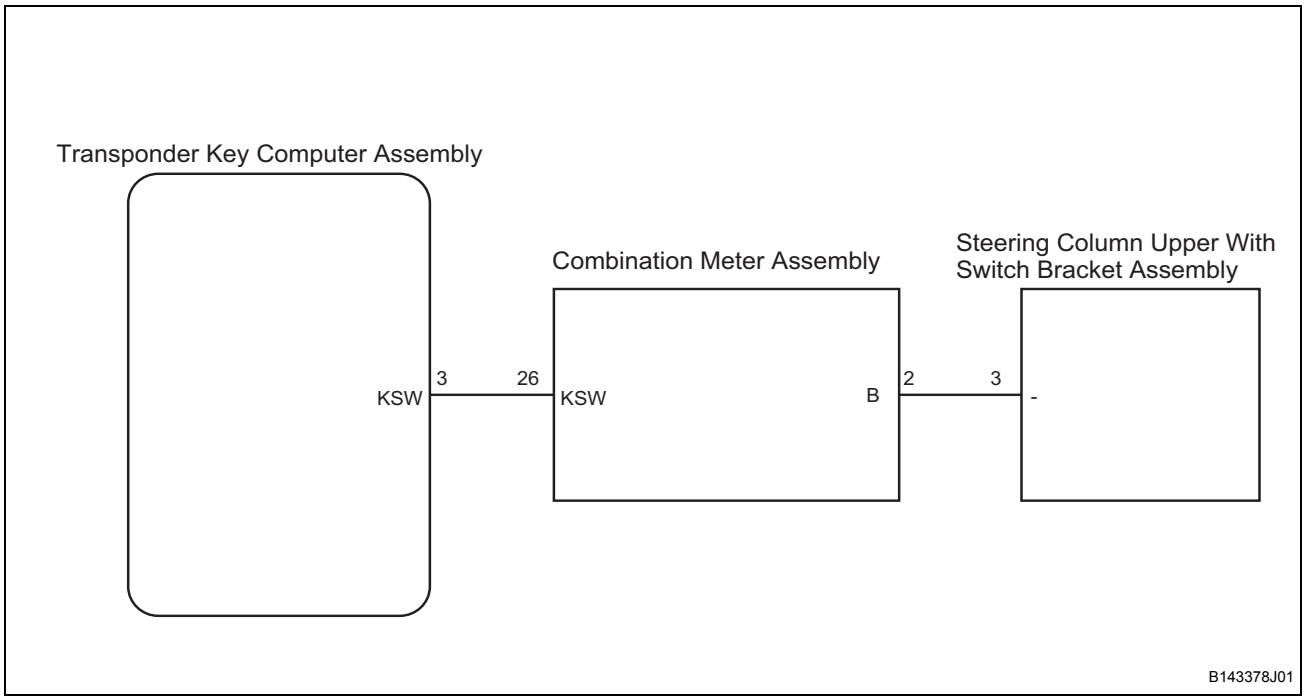
DTC B2780/15 Open in the PUSH or KEY SW circuit

DESCRIPTION

The transponder key computer assembly outputs this code when KSW signals are not received with the ignition switch on.

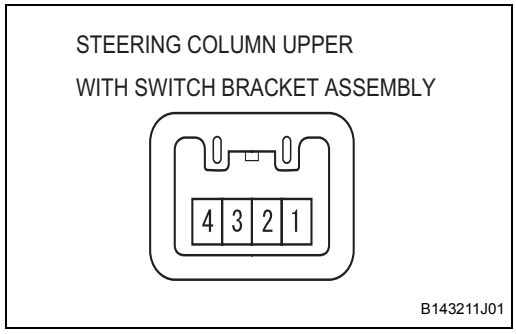
DTC No.	DTC Detection Condition	Trouble Area
B2780/15	KSW signal is not received with the ignition switch on.	• Wire harness or connector • Steering column upper with switch bracket assembly • Transponder key computer assembly • Combination meter assembly

CIRCUIT DIAGRAM



INSPECTION PROCEDURE

1	CHECK WIRE HARNESS AND CONNECTOR (POWER SOURCE CIRCUIT CHECK)



(a) Insert the key to the ignition knob.

(b) Measure the voltage between terminal 4 (+) and the body ground using the tester.

Standard:

10 to 14 V

NG	CHECK AND REPAIR POWER SOURCE CIRCUIT

OK

2	READ DATA USING DS-II (KEY SW)

(a) Connect the DS-II to the DLC.
(b) Using the DS-II, following the prompts on the screen, select ECU DATA LIST and KEY SW.
(c) Check any changes in the switch condition (ON or OFF) when the key is inserted to the ignition knob.

Standard

Measurement Condition	Screen Display
When the key is inserted to the ignition knob	ON
When the key is not inserted to the ignition knob	OFF

NG → **REPLACE STEERING COLUMN UPPER WITH SWITCH BRACKET ASSEMBLY**

OK

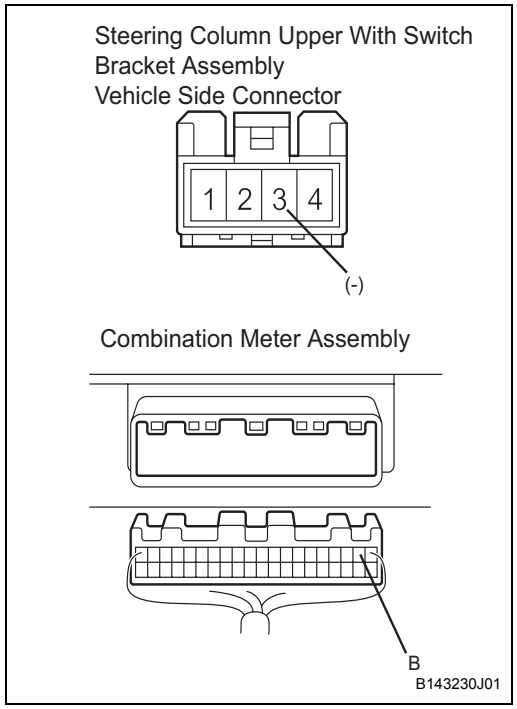
3	CHECK WIRE HARNESS AND CONNECTOR

(a) Disconnect the steering column upper with switch bracket assembly and combination meter assembly connectors.
(b) Using the tester, measure the continuity between terminals of the connector on the vehicle side.

Standard

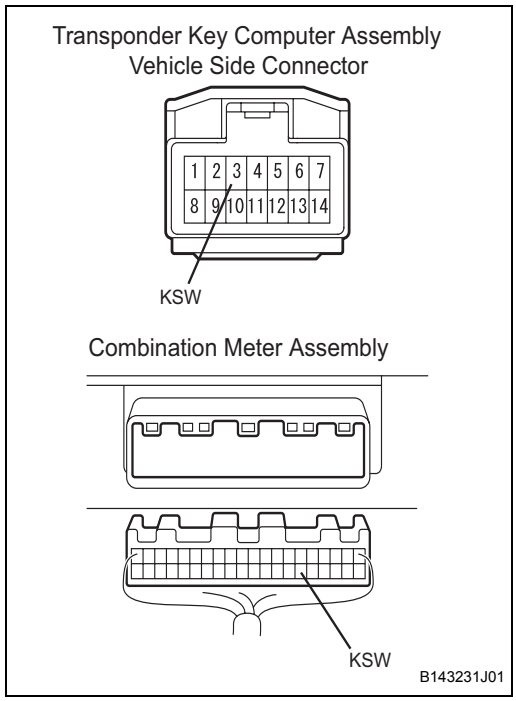
Terminal No. (Terminal Symbols) Steering Column Upper with Switch Bracket Assembly ⟷ Combination Meter Assembly	Continuity
3 (-) ⟷ 2 (B)	Continuity

NG → **REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR**



OK

4 **CHECK WIRE HARNESS AND CONNECTOR**



(a) Disconnect the transponder key computer assembly and the combination meter assembly connectors.

(b) Using the tester, measure the continuity between terminals of the connector on the vehicle side.

Standard

Terminal No. (Terminal Symbols) Transponder Key Computer Assembly ⟷ Combination Meter Assembly	Continuity
3 (KSW) ⟷ 26 (KSW)	Continuity

NG → **REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR**

OK

5 **REPLACE TRANSPONDER KEY COMPUTER ASSEMBLY**

(a) Replace the transponder key computer assembly and register the key code.

(b) Clear DTCs using the DS-II.

6 **CHECK FOR DTCs**

(a) Check for DTCs using the DS-II.

Standard

Result	Proceed to
DTC B2780/15 is not output	A
DTC B2780/15 is output	B

B → **REPLACE COMBINATION METER ASSEMBLY**

A

END

DTC	B2788/41	Communication Error (code does not match)

DTC	B2789/42	Communication Error (no response)

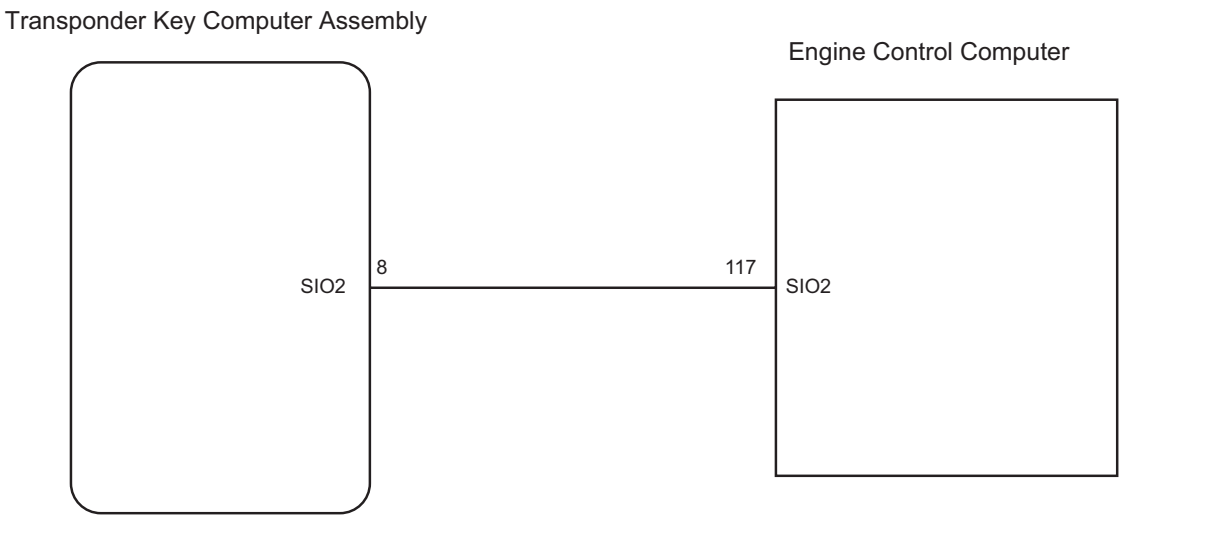
DESCRIPTION

The transponder key computer assembly outputs these codes if it receives a code unmatched signal when communicating with the engine control computer or if signals are not received from the engine control computer.

DTC No.	DTC Detection Condition	Trouble Area
B2788/41	The transponder key computer receives a code unmatched signal when communicating with the engine control computer.	• Wire harness or connector • Engine control computer • Transponder key computer assembly
B2789/42	The transponder key computer does not receive signals from the engine control computer when communicating with the engine control computer.	• Wire harness or connector • Engine control computer • Transponder key computer assembly

EI

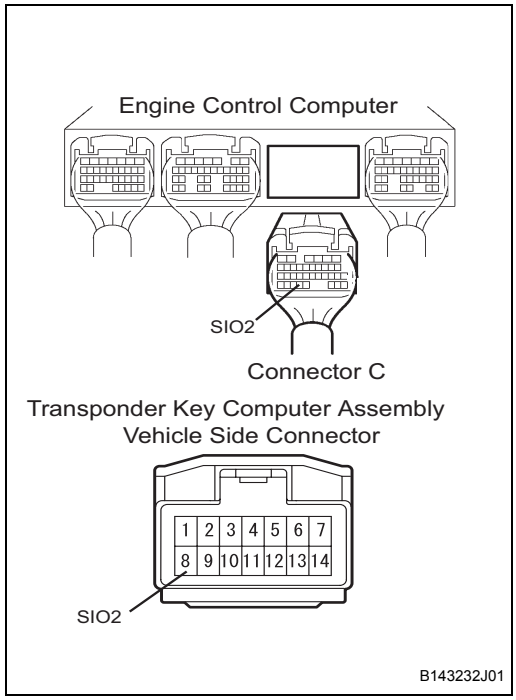
CIRCUIT DIAGRAM



INSPECTION PROCEDURE

1	CHECK WIRE HARNESS AND CONNECTOR

(a) Disconnect the transponder key computer assembly (immobiliser ECU) connector and the engine control computer (engine ECU) connector C.



(b) Using the tester, measure the continuity between terminals of the connector on the vehicle wire harness side.

Standard

Terminal No. (Terminal Symbols) Immobilizer ECU ⟷ Engine ECU	Continuity
8 (SIO2) ⟷ 117 (SIO2)	Continuity

NG → **REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR**

EI

OK

2 **REPLACE TRANSPONDER KEY COMPUTER ASSEMBLY**

(a) Replace the transponder key computer assembly and register the key code.

(b) Clear DTCs using the DS-II.

3 **CHECK FOR DTCs**

(a) Check for DTCs using the DS-II.

Standard

Result	Proceed to
DTCs B2788/41 and B2789/42 are not output	A
DTCs B2788/41 and B2789/42 are output	B

B → **REPLACE ENGINE CONTROL COMPUTER**

A

END

DTC	B2793/23	Immobiliser: Communication Malfunction 1

DESCRIPTION

The transponder key computer assembly outputs this code if a problem is detected during key code registration or if the key code is not successfully registered.

DTC No.	DTC Detection Condition	Trouble Area
B2793/23	Trouble in key code registration	• Key

INSPECTION PROCEDURE

EI

1	RE-REGISTRATION OF THE KEY THAT DOES NOT START ENGINE

(a) Clear DTCs using the DS-II.
(b) Re-register the key that does not start the engine.
(c) Check that the ignition switch is turned to the ON position and the engine is started using the key.

OK → NO PROBLEM

NG

REPLACE KEY THAT CAUSES B2793 TO BE OUTPUT

DTC B2794/22 Immobiliser: Communication Malfunction 2

DESCRIPTION

The transponder key computer assembly outputs these codes if a malfunction is detected in communication between the transponder key computer assembly and the key.

DTC No.	DTC Detection Condition	Trouble Area
B2794/22	Code key does not match	• Key • Transponder key computer assembly

INSPECTION PROCEDURE

1	CHECK OPERATION WITH ANOTHER KEY

(a) Check if the ignition switch is turned to the ON position and the engine is started using another key.

Standard:

The ignition switch is turned to the ON position and the engine is started.

OK → **REPLACE KEY THAT DOES NOT START ENGINE**

NG

REPLACE TRANSPONDER KEY COMPUTER ASSEMBLY

DTC B2795/21 Main Key ID Code Does Not Match

DESCRIPTION

The transponder key computer assembly outputs these codes if a malfunction is detected in communication between the transponder key computer assembly and the key.

DTC No.	DTC Detection Condition	Trouble Area
B1795/21	Key ID code does not match.	• Key • Transponder key computer assembly

EI

INSPECTION PROCEDURE

1	Key re-registration

(a) Clear DTCs using the DS-II.
(b) Re-register the key.
(c) Check that the ignition switch is turned to the ON position and the engine is started using the key.

NG → REPLACE KEY

OK

REPLACE TRANSPONDER KEY COMPUTER ASSEMBLY

DTC	B2796/12	Main Key or Coil Malfunction

DTC	B2797/24	Immobiliser: Communication Malfunction 4

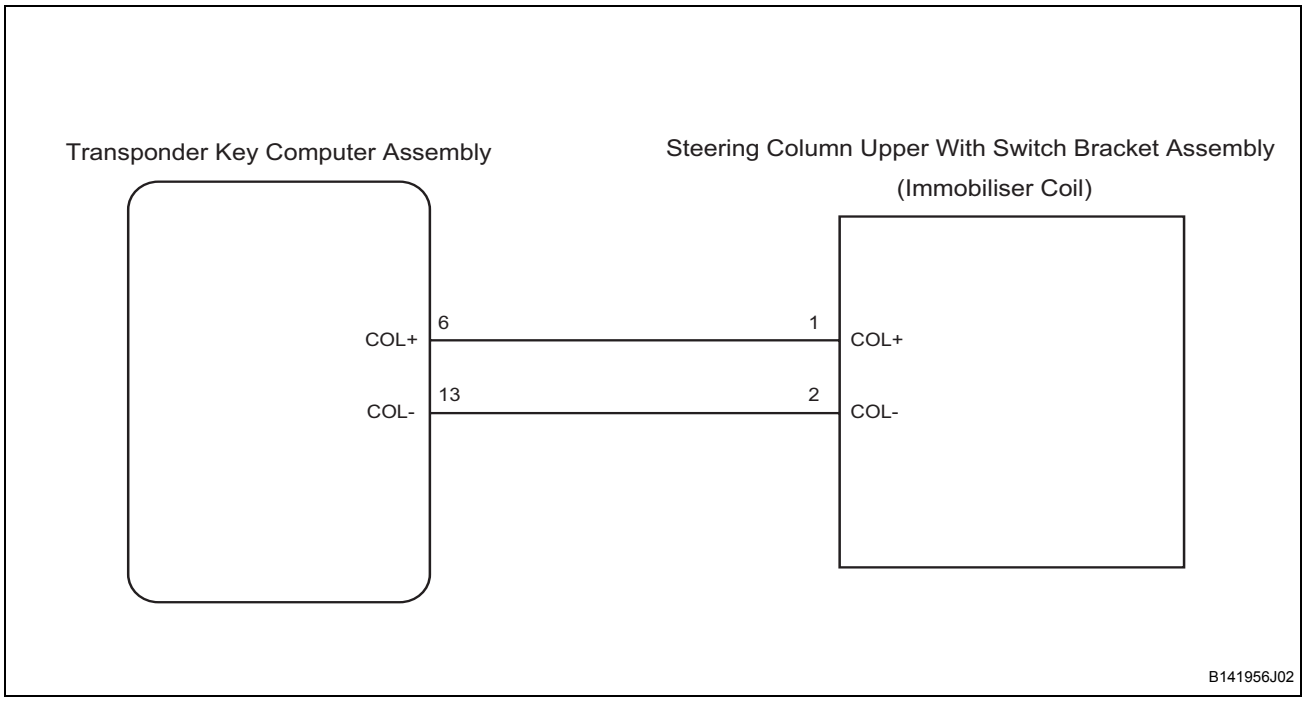
DTC	B2798/25	Immobiliser: Communication Malfunction 5

DESCRIPTION

Those codes will be output through the transponder key computer assembly if a malfunction occurs due to a defect in the key or the immobiliser in communication.

DTC No.	DTC Detection Condition	Trouble Area
B2796/12	ID code is not sent back	• Wire harness or connector • Key • Transponder key computer assembly • Steering column upper with switch bracket assembly (immobiliser coil)
B2797/24	Transponder communication trouble	• Wire harness or connector • Key • Transponder key computer assembly • Steering column upper with switch bracket assembly (immobiliser coil)
B2798/25	Complete data is not received within a specified time	• Wire harness or connector • Key • Transponder key computer assembly • Steering column upper with switch bracket assembly (immobiliser coil)

CIRCUIT DIAGRAM



INSPECTION PROCEDURE

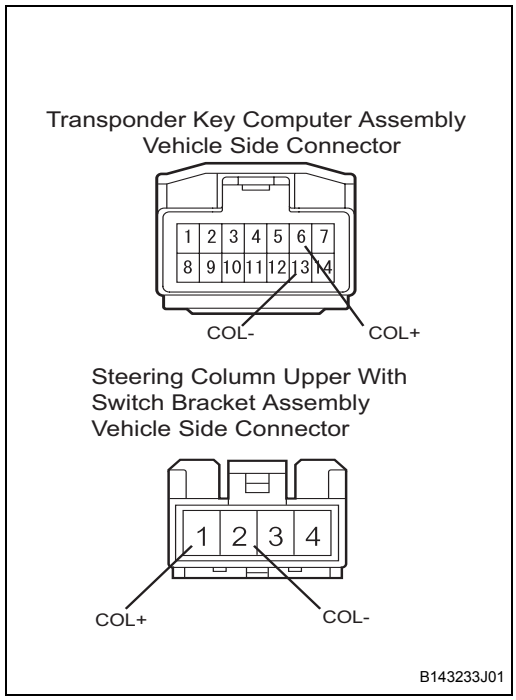
1	CHECK WIRE HARNESS AND CONNECTOR

(a) Disconnect the connectors from the transponder key computer assembly (immobiliser ECU) and the steering column upper with switch bracket assembly (immobiliser ECU).

(b) Using the tester, measure the continuity between terminals of the connector on the vehicle wire harness side.

Standard

Terminal No. (Terminal Symbols) Transponder ECU ⟷ Immobiliser Coil	Continuity
6(COL+) ⟷ 1(COL-)	Continuity
13(COL+) ⟷ 2(COL-)	Continuity



NG → **REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR**

OK

2	CHECK OPERATION WITH ANOTHER KEY

(a) Check if the ignition switch is turned to the ON position and the engine is started using another key.

Standard:

The ignition switch is turned to the ON position and the engine is started.

OK → **REPLACE KEY THAT DOES NOT START ENGINE**

NG

3	REPLACE TRANSPONDER KEY COMPUTER ASSEMBLY

(a) Replace the transponder key computer assembly and register the key code.

(b) Clear DTCs using the DS-II.

4	CHECK FOR DTCs

(a) Check for DTCs using the DS-II.

Standard

Result	Proceed to
DTCs B2796/12, B2797/24 and B2798/25 are not output	A
DTCs B2796/12, B2797/24 and B2798/25 are output	B

B → REPLACE STEERING COLUMN UPPER WITH SWITCH BRACKET ASSEMBLY

A

END

DTC	B2797/24	Immobiliser: Communication Malfunction 4

DTC	B2798/25	Immobiliser: Communication Malfunction 5

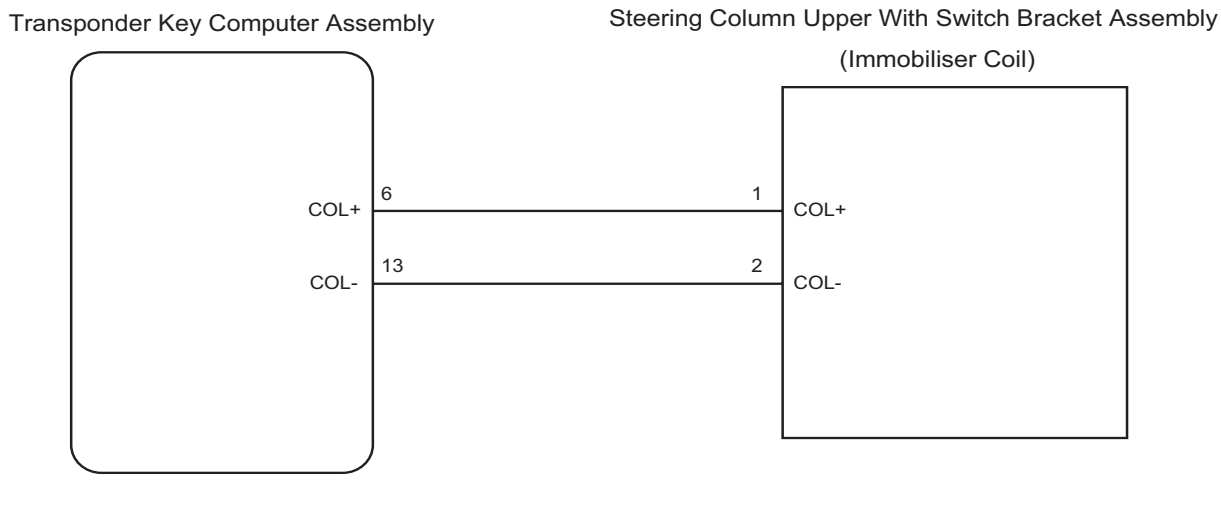
DESCRIPTION

The transponder key computer assembly outputs these codes if a malfunction is detected in communication between the transponder key computer assembly and the steering column upper with switch bracket assembly.

DTC No.	DTC Detection Condition	Trouble Area
B2797/24	Transponder communication trouble	• Wire harness or connector • Transponder key computer assembly • Steering column upper with switch bracket assembly
B2798/25	Complete data is not received within a specified time	• Wire harness or connector • Transponder key computer assembly • Steering column upper with switch bracket assembly

EI

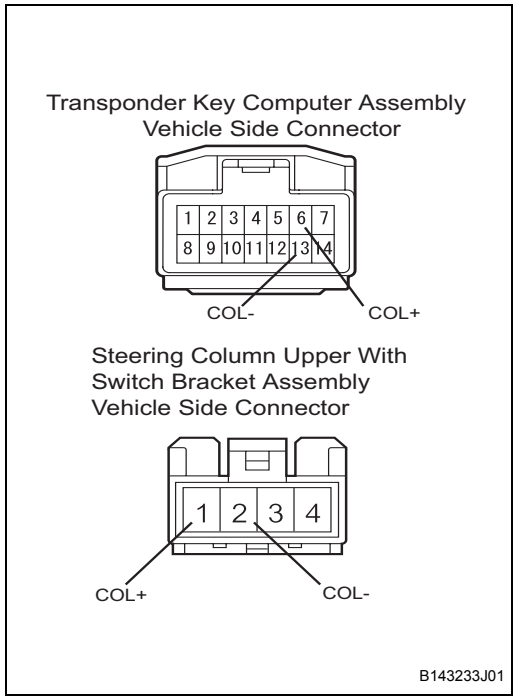
CIRCUIT DIAGRAM



INSPECTION PROCEDURE

1	CHECK WIRE HARNESS AND CONNECTOR

(a) Disconnect the connectors from the transponder key computer assembly and the steering column upper with switch bracket assembly.



(b) Using the tester, measure the continuity between terminals of the connector on the vehicle wire harness side.

Standard

Terminal No. (Terminal Symbols) Immobiliser ECU ⟷ Steering column upper with switch bracket assembly	Continuity
6(COL+) ⟷ 1(COL-)	Continuity
13(COL+) ⟷ 2(COL-)	Continuity

NG → **REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR**

EI

OK

2 REPLACE TRANSPONDER KEY COMPUTER ASSEMBLY

(a) Replace the transponder key computer assembly and register the key code.

(b) Clear DTCs using the DS-II.

3 CHECK FOR DTCs

(a) Check for DTCs using the DS-II.

Standard

Result	Proceed to
DTCs B2797/24 and B2798/25 are not output	A
DTCs B2797/24 and B2798/25 are output	B

B → **REPLACE STEERING COLUMN UPPER WITH SWITCH BRACKET ASSEMBLY**

A

END